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|                        | The Project for Improvement of Management Capacity of Operation and |
|------------------------|---|
| Arab Republic of Egypt | Maintenance for Water Supply Facilities in Nile Delta Area          |

# I. Project Outline

| <b>u</b>                    |   |  |  |  |  |  |
|-----------------------------|---|--|--|--|--|--|
| Background                  | In 2004, the Egyptian Government established the Holding Company for Water and Wastewater (HCWW) and designated water-supply entities into public corporations. Since the managerial responsibility for operation and maintenance (O&M) of water supply facilities was transferred to public corporations, each company urged to improve operational efficiency and reduce Non-Revenue Water (NRW), which is potable water that cannot be billed, for example, due to leakage and illegal taps. JICA carried out a technical cooperation project, "the Project for Improvement of Management Capacity of Operation and Maintenance for SHAPWASCO (Sharkiya Potable Water and Sanitation Company)" between 2006 and 2009, which confirmed the effectiveness of utilizing Standard Operation Procedures (SOPs) and implementing NRW reduction activities to improve operational efficiency. HCWW formulated a plan to transfer successful practices and lessons learned from the previous technical cooperation project to Nile Delta Area for improving management capacity.   |  |  |  |  |  |
| Objectives of the Project   | Through strengthening human resource development in Sharkiya, Gharbia and Minufia Governorates, developing and utilizing SOPs at the model facilities in Gharbia and Minufia Governorates, transferring institutional skills and experiences of SHAPWASCO for NRW reduction to NRW teams in Gharbia and Minufia Governorates, and improving water distribution management (WDM) capacity in Sharkiya Governorate as an advanced model, the project aimed at improving management capacity of water supply facilities at the model areas/facilities in the above three Governorates, thereby improving management capacity of water supply facilities in these Governorates as a whole.  |  |  |  |  |  |
|                             | <ol> <li>Overall Goal: Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia Governorates.</li> <li>Project Purpose: Management capacity of operation and maintenance of water supply facilities is improved at the model areas/facilities in Sharkiya, Gharbia and Minufia Governorates.</li> </ol>   |  |  |  |  |  |
| Activities of the Project   | <ol> <li>Project Site: Sharkiya, Gharbia and Minufia Governorates ((1) model facilities for SOP activities: Tanta El Teraa El Melahia water treatment plant (WTP), Mahalet Marhoom iron and manganese removal plant (IMRP) and Severbay Well Station in Gharbia Governorate, Mahalet El Sadat El Satheya WTP, Gezy IMRP and Ashama Well Station in Minufia Governorate, (2) model areas for NRW reduction activities: Tanta markaz, El Mahalla El Kobra markaz and Zefta markaz in Gharbia Governorate, Shebeen El Kom markaz, Quesna markaz and Barket El Sab'a markaz in Minufia Governorate, (3) model area for WDM: Zagazig city in Sharkiya Governorate)</li> <li>Main Activities: (1) Conduct management training for the top management and Training of Trainers (TOT) for developing SOPs and NRW reduction; (2) Conduct training for developing and applying SOPs, revise SOPs for SHAPWASCO, develop SOPs for model facilities in Gharbia and Minufia Governorates based on SOPs for SHAPWASCO and conduct On-the-Job Training (OJT) for Gharbia Potable Water and Sanitation Company (GHAPWASCO) and Minufia Company for Water and Wastewater (MCWW) to apply SOPs in O&amp;M (3) Conduct training on general practice of NRW reduction, training at the training yard and model areas for WDM in Sharkiya Governorate, prepare GIS drawing for model areas in Gharbia and Minufia Governorates and conduct water balance analysis and leakage detection survey at model areas; and (4) Formulate a plan for WDM, install the equipment for WDM at the model area, operate the system and develop SOP for WDM etc.</li> <li>Inputs (to carry out above activities)</li> <li>Experts: 12 persons</li> <li>Equipment: leak detection devices, ultrasonic water flow accountion cost (including construction acoustic rods, central monitoring system, telemeters, water-level indicators, pipe and cable locators, accountion cost (including construction cost to accommodate WDM-related equipment and construction cost of chambers to install flow meters etc.)</li> </ol> |  |  |  |  |  |
| Project Period              | April 2011 – May 2015 (Extension Period: April 2014 – May 2015)  Project Cost (ex-ante) 510 million yen, (actual) 502 million yen   |  |  |  |  |  |
| Implementing<br>Agency      | Holding Company for Water and Wastewater (HCWW), Sharkiya Potable Water and Sanitation Company (SHAPWASCO), Gharbia Potable Water and Sanitation Company (GHAPWASCO), Minufia Company for Water and Wastewater (MCWW)   |  |  |  |  |  |
| Cooperation Agency in Japan | Yachiyo Engineering Co., Ltd.   |  |  |  |  |  |

# II. Result of the Evaluation

1 Relevance

<Consistency with the Development Policy of Egypt at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with Egypt's development policy such as "efficient O&M of water supply facilities" as set forth in "National

Water Resources Plan (2003-2017)", the "Sixth Five-Year Plan of Egypt (2007-2012)" and the "Annual Development Plan (2013-2014)" (issued by the Ministry of Planning) at the times of both ex-ante evaluation and project completion.

<Consistency with the Development Needs of Egypt at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with Egypt's development needs for increasing the capability for operational efficiency in water supply companies at the times of both ex-ante evaluation and project completion.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan's ODA policy as stated in the "Country Assistance Program for Egypt" (2008), which included "development of living infrastructure like water supply, sewage, and waste treatment in combination with strengthening of their operation and maintenance systems" under "poverty reduction and improvement of living standard".

<Evaluation Result>

In light of the above, the relevance of the project is high.

## 2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the time of project completion. As shown in tables below, most Performance Indicators (PIs) were improved after the project implementation and targets set for these PIs were mostly achieved. While one of the PIs for WDM, i.e. the number of complaints per 1,000 connections on water suspension and low pressure, got overly worsened during the project period, this was due to the fact that electricity suspensions were increased dramatically in 2013/2014 and 2014/2015, which was out of control of SHAPWASCO.

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have continued to the time of ex-post evaluation. SOP activities have continued at the model facilities<sup>1</sup> and expanded to five WTPs and five IMRPs in Gharbia Governorate and four WTPs in Minufia Governorate since project completion. NRW reduction activities have also continued in the model areas, and implementation of the Five-Year Plan for NRW Reduction formulated under the project has been completed. Both GHAPWASCO and MCWW have started a new NRW reduction plan to cover the whole Governorates. Furthermore, WDM activities have also continued in the model area and expanded to 12 WTPs and three other areas in Sharkiya Governorate. Accordingly, most PIs for the model facilities and areas have generally been maintained at the improved level since project completion as shown in tables below.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been partially achieved by the time of ex-post evaluation. Among five WTPs and five IMRPs in Gharbia Governorate and four WTPs in Minufia Governorate where SOP activities have expanded to after project completion, most PIs were improved in 2018 compared with baseline figures. However, targets set for PIs have been partially achieved in WTPs and IMRPs, because the number of pump stations has increased in some WTPs resulting in an increase of energy consumption and more chemicals have been required in some facilities due to the change of raw water quality. The NRW ratio in 2018 was largely improved compared with baseline figures in both Governorates, though the 2018 ratio was slightly below the target in Minufia Governorate. On the other hand, data on WDM in Sharkiya Governorate as a whole at the time of ex-post evaluation was not available.

<Other Impacts at the time of Ex-post Evaluation>

According to MCWW, owing to this project, more attention has been paid to water losses and rehabilitations/renewals of water supply networks have increased to reduce water losses within the company.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

Achievement of Project Purpose and Overall Goal

| Aim                    | Indicators              | Results   |  |  |   |                       |  |
|------------------------|-------------------------|---|--|--|---|-----------------------|--|
| (Project Purpose)      | PIs(*) in the fields of | Status of the Achievement: achieved (continued)   |  |  |   |                       |  |
| Management capacity of | management capacity     | (Project Completion) Most PIs were improved and targets were mostly achieved in most PIs. (As for |  |  |   |                       |  |
| operation and          | of operation and        | SOP-related PIs, actual figures exc   | cept for energy con                        | nsumption in Gez                             | y IMRP were imp                             | roved                 |  |
| maintenance of water   | _                       | compared with baseline figures. A   |  | _  |   |                       |  |
| supply facilities is   |                         | areas compared with baseline figu   |  |  | _   |                       |  |
|                        | areas/facilities.       | water distribution was improved c   |  |  | • • •                                       | •                     |  |
| areas/facilities in    | dieds/idemities.        | 1,000 connections on water suspen   | •  | •  |   |                       |  |
| Sharkiya, Gharbia and  |                         | (Ex-post Evaluation) Most PIs have  | -  |  | -   | ied above.)           |  |
| Minufia Governorates.  |                         | ,   | e been mamame                              | i at the improved                            | ievei.                                      |                       |  |
| Winulia Governorates.  |                         | [SOP]   |  |  |   |                       |  |
|                        |                         | Model Facilities in Gharbia Gover   | Model Facilities in Gharbia Governorate    |  |   |                       |  |
|                        |                         | 87  |  | Amount of                                    | Amount of alum                              | Effective             |  |
|                        |                         | Tanta El Teraa El Melahia WTP   | consumption<br>per m <sup>3</sup> of water | chlorine used<br>per m <sup>3</sup> of water | sulfate used per<br>m <sup>3</sup> of water | utilization<br>of raw |  |
|                        |                         |   | production                                 | production                                   | production                                  | water                 |  |
|                        |                         |   |  | 38g/m <sup>3</sup>                           | 85%   |                       |  |
|                        |                         |   |  | 35g/m <sup>3</sup>                           | 90%   |                       |  |
|                        |                         | Average during April to June 2014 0.36kWh/m <sup>3</sup> 8g/m <sup>3</sup> 37g/m <sup>3</sup>     |  | $37g/m^3$                                    | 87%   |                       |  |
|                        |                         | Annual Average in 2018 0.38kWh/m <sup>3</sup> 8g/m <sup>3</sup> 39g/m <sup>3</sup>                |  | $39g/m^3$                                    | 90%   |                       |  |
|                        |                         | Amount of Amount of   |  |  |   |                       |  |
|                        |                         |   |  | potassium                                    | Effective                                   |                       |  |
|                        |                         | Mahalet Marhoom IMRP  | consumption                                | hypochlorite                                 | permanganate                                | utilization           |  |
|                        |                         |   | per m <sup>3</sup> of water                | used per m <sup>3</sup> of                   | used per m <sup>3</sup> of                  | ofraw                 |  |
|                        |                         | production water water  |  | production                                   | water                                       |                       |  |
|                        |                         | Baseline (Nov 2012)   | 0.76kWh/m <sup>3</sup>                     | production<br>7g/m <sup>3</sup>              | 3g/m <sup>3</sup>                           | N/A                   |  |
|                        |                         | Target  | 0.60kWh/m <sup>3</sup>                     | 6g/m <sup>3</sup>                            | $\frac{3g/m}{2g/m^3}$                       | 96%                   |  |

<sup>&</sup>lt;sup>1</sup> Some WTPs and IMRPs operated and maintained by GHAPWASCO and MCWW have been handed over to other organizations under the Ministry of Housing, Utilities and Urban Communities according to Presidential Decrees after project completion.

|   |   | Average duri   | ng Jan to Mar 2014   | 0.62   | 2kWh/m³  | $3g/m^3$   | $2g/m^3$   | 96%   |  |
|---|---|--|--|--|--|--|--|---|--|
|   |   | Annual Avera   |  |  | 3kWh/m <sup>3</sup>  | 4g/m <sup>3</sup>  | 2g/m <sup>3</sup>  | 94%   |  |
|   |   | -  |  |  |  | - B'   |  | , , , , , ,   |  |
|   |   | TTOGET T ACIII   | Model Facilities in Minufia Governorate  Energy Amount of Amount of alum Effective   |  |  |  |  |   |  |
|   |   | Mohatet El C   | adat El Sath WITE  |  | sumption   | chlorine used  | sulfate used p   |   |  |
|   |   | Manatet El S   | adat El Satheya WTP  | per n  | n <sup>3</sup> of water  | per m3 of water  | m <sup>3</sup> of water  |   |  |
|   |   | D 1 (01 - 2012)  |  |  | oduction   | production   | production   | water   |  |
|   |   | Baseline (No<br>Target   | V 2012)  |  | 5kWh/m <sup>3</sup><br>6kWh/m <sup>3</sup>   | $\frac{9g/m^3}{7g/m^3}$  | 26g/m <sup>3</sup><br>18g/m <sup>3</sup>   | 88%<br>92%  |  |
|   |   |  | ng April to June 2014  |  | 6kWh/m <sup>3</sup>  | /g/m <sup>3</sup><br>6g/m <sup>3</sup>   | 25g/m <sup>3</sup>   | 94%   |  |
|   |   | Annual Aver  |  | 0.5  | N/A  | N/A  | N/A  | N/A   |  |
|   |   | 7 Hilliau 7 TV CI  | age in 2010  |  | 11/11  | Amount of  | Amount of  |   |  |
|   |   |  |  |  | Energy   | calcium  | potassium  | Effective   |  |
|   |   | Gezy IMRP  |  |  | sumption   | hypochlorite   | permanganat  |   |  |
|   |   | ,  |  |  | n <sup>3</sup> of water  | used per m <sup>3</sup> of   | used per m <sup>3</sup> o  |   |  |
|   |   |  |  | pro  | oduction   | water<br>production  | water<br>production  | water   |  |
|   |   | Baseline (No   | v 2012)  | 0.8  | kWh/m³   | 4g/m <sup>3</sup>  | 2g/m <sup>3</sup>  | 84%   |  |
|   |   | Target   | /  |  | kWh/m³   | $7g/m^3$   | $1 \text{ g/m}^3$  | 92%   |  |
|   |   | Average duri   | ng April to June 2014  | 0.8  | kWh/m <sup>3</sup>   | 7g/m <sup>3</sup>  | $1\mathrm{g/m^3}$  | 89%   |  |
|   |   | Annual Avera   | age in 2018  | 0.8  | kWh/m <sup>3</sup>   | $7g/m^3$   | $1\mathrm{g/m^3}$  | 92%   |  |
|   |   | [NRW]  |  |  | _  | -  |  |   |  |
|   |   |  |  |  |  | _  | After Project  | Annual Averag   |  |
|   |   | Model Are  | as PI  |  | Baselin  | e Target   | 2014   | in 2018   |  |
|   |   | Gharbia Gov  |  |  |  |  |  |   |  |
|   |   | Tanta  | NRW rati   |  | 40.1%  |  | 24.7%  | 24%   |  |
|   |   |  | Reduction rate of  |  |  | 30.0%  | 38.4%  | 40%   |  |
|   |   | El Mahalla   | El NRW rati  | 0  | 27.1%  | 20.3%  | 22.0%  | 19%   |  |
|   |   | Kobra  | Reduction rate of  | of NRW   | 7 -  | 25.0%  | 18.8%  | 30%   |  |
|   |   | Zefta  | NRW rati   |  | 21.2%  |  | 21.0%  | 15%   |  |
|   |   |  | Reduction rate of  | of NRW   | -  | 25.0%  | 0.9%   | 29%   |  |
|   |   | Minufia Gov  |  |  | 1 10 50  | T  | 4 6 70 4   |   |  |
|   |   | Shebeen El k   | Xom NRW rati   |  | 19.6%  |  | 16.5%  | 20%   |  |
|   |   |  | Reduction rate of  |  |  | 25.0%  | 15.8%  | -2%   |  |
|   |   | Quesna   | NRW rati   |  | 29.8%  |  | 22.5%  | 20%   |  |
|   |   |  | Reduction rate of  |  |  | 25.0%  | 24.5%  | 33%   |  |
|   |   | Berket El Sal  | b'a NRW rati   |  | 27.1%  |  | 20.2%  | 20%   |  |
|   |   |  | Reduction rate of  | of NRW   | /   -  | 25.0%  | 25.4%  | 26%   |  |
|   |   | [WDM]  |  |  |  |  |  |   |  |
|   |   |  | PI   |  | Baseline   | Target   | 2014/15  | 2018  |  |
|   |   | Number   | of complaints per 1,000  |  |  |  |  |   |  |
|   |   |  |  |  |  |  |  |   |  |
|   |   |  | on water suspension and  | low  | 13.92  | 11.13  | 42.67  | 10  |  |
|   |   | connections  |  | low  | 13.92  | 11.13  | 42.67  | 10  |  |
|   |   | connections of pres  | on water suspension and sure in Zagazig city   |  |  |  | 42.67  |   |  |
|   |   | connections of pres  | on water suspension and<br>sure in Zagazig city<br>ppropriate pressure of wa   |  | 13.92<br>8.0%  | 7.0%   | 7.0%   | 5.0%  |  |
|   |   | Ratio of ina   | on water suspension and<br>sure in Zagazig city<br>ppropriate pressure of wa<br>oution in Zagazig city   | ater   |  |  |  |   |  |
| (Overall Goal)  | PIs (*) in the fields of  | Ratio of inal distrib  | on water suspension and<br>sure in Zagazig city<br>ppropriate pressure of wa<br>oution in Zagazig city<br>luation) partially achi  | ater<br>eved   | 8.0%   | 7.0%   | 7.0%   | 5.0%  |  |
| `   | management capacity   | Ratio of inal distrib  (Ex-post Eva Regarding So   | on water suspension and sure in Zagazig city  ppropriate pressure of water of in Zagazig city  luation) partially achi OP, most PIs have bee   | eved<br>n impr   | 8.0%   | 7.0%   | 7.0%   | 5.0%<br>th Gharbia and  |  |
| Management capacity of  | management capacity   | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Gov   | on water suspension and sure in Zagazig city  ppropriate pressure of water of in Zagazig city  luation) partially achi OP, most PIs have bee ernorates, though targ  | eved<br>n impr   | 8.0%   | 7.0%<br>ared with baselii  | 7.0% ne figures in bo  | 5.0%<br>th Gharbia and<br>RPs. The NRV  |  |
| Management capacity of operation and  | management capacity of operation and  | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Govratio has been   | on water suspension and sure in Zagazig city  ppropriate pressure of water of in Zagazig city  luation) partially achi OP, most PIs have bee ernorates, though targen largely improved co  | eved<br>n imprets hav  | 8.0%  roved compart we been part d with basel  | 7.0%<br>ared with baselii<br>ially achieved in<br>line figures in bo   | 7.0%  ne figures in bon WTPs and IM oth Governorate  | 5.0%<br>th Gharbia and<br>RPs. The NRV  |  |
| Management capacity of operation and maintenance of water   | management capacity<br>of operation and<br>maintenance are  | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Govratio has been hand, data or   | on water suspension and sure in Zagazig city  ppropriate pressure of water of in Zagazig city  luation) partially achi OP, most PIs have bee ernorates, though targ  | eved<br>n imprets hav  | 8.0%  roved compart we been part d with basel  | 7.0%<br>ared with baselii<br>ially achieved in<br>line figures in bo   | 7.0%  ne figures in bon WTPs and IM oth Governorate  | 5.0%<br>th Gharbia and<br>RPs. The NRV  |  |
| Management capacity of operation and maintenance of water supply facilities is  | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,                         | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Govratio has been hand, data or [SOP]   | on water suspension and sure in Zagazig city  ppropriate pressure of water of the potential properties of water of the potential properties of the potential properties of the | eved<br>n imprets hav  | 8.0%  roved compart we been part d with basel  | 7.0%<br>ared with baselii<br>ially achieved in<br>line figures in bo   | 7.0%  ne figures in bon WTPs and IM oth Governorate  | 5.0%<br>th Gharbia and<br>RPs. The NRV  |  |
| Management capacity of operation and maintenance of water supply facilities is  | management capacity<br>of operation and<br>maintenance are  | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Govratio has been hand, data or   | on water suspension and sure in Zagazig city  ppropriate pressure of water of the potential properties of water of the potential properties of the potential properties of the | eved<br>n imprets hav  | 8.0%<br>roved compart<br>d with basel<br>orate as a wi   | 7.0%  ared with baselinially achieved in both baseline figures in both baseline figures are available.   | 7.0%  ne figures in bon WTPs and IM oth Governorate  | 5.0%<br>th Gharbia and<br>RPs. The NRV  |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya,  | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,                         | Ratio of inal distribution (Ex-post Eva Regarding So Minufia Govratio has been hand, data or [SOP]   | on water suspension and sure in Zagazig city  ppropriate pressure of water of the potential properties of water of the potential properties of the potential properties of the | eved<br>n impress have<br>mpared   | 8.0%  roved comparted with basel orate as a will   | 7.0%  ared with baselii ially achieved in the figures in both hole was not available.  Amount of   | 7.0%  ne figures in bon WTPs and IM oth Governorate  | 5.0%<br>th Gharbia and<br>RPs. The NRV<br>es. On the other  |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | on water suspension and sure in Zagazig city  ppropriate pressure of water of the potential properties of water of the potential properties of the potential properties of the | eved<br>n impress have<br>mpared   | 8.0%  roved comparted with basel orate as a with the series of the serie | 7.0%  ared with baseling ially achieved in the figures in both hole was not available.  Amount of chlorine used  | 7.0%  ne figures in bon WTPs and IM oth Governorate ailable.  Amount of alu sulfate used p   | 5.0%  th Gharbia and RPs. The NRVes. On the other   |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distrib  (Ex-post Eva Regarding St Minufia Gov ratio has been hand, data or [SOP] Gharbia Gov  | on water suspension and sure in Zagazig city  ppropriate pressure of water of the potential properties of water of the potential properties of the potential properties of the | eved<br>n impress have<br>mpared   | 8.0%  roved compared with basel orate as a winder of the consumption per m³ of   | 7.0%  ared with baselinially achieved in time figures in behole was not available.  Amount of chlorine used per m³ of  | 7.0%  ne figures in bon WTPs and IM oth Governorate ailable.  Amount of alu sulfate used p m³ of water   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw   |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | on water suspension and sure in Zagazig city  ppropriate pressure of water in Zagazig city  lluation) partially achi OP, most PIs have bee ernorates, though targen largely improved con wDM in Sharkiya Gernorate   | eved<br>n imprets hav<br>mpared<br>overno  | 8.0%  roved compare been part d with basel prate as a wind substitution of the compare of the co | 7.0%  ared with baseling ially achieved in the figures in both hole was not available.  Amount of chlorine used  | 7.0%  ne figures in bon WTPs and IM oth Governorate ailable.  Amount of alu sulfate used p   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water   |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  luation) partially achi  OP, most PIs have bee ernorates, though targen largely improved con wDM in Sharkiya Gernorate  Baseline  | eved<br>n impress have<br>mpared<br>overno   | 8.0%  roved compart d with basel orate as a wine  Energy consumption per m³ of water production 0.40kWh/m³   | 7.0%  Ared with baselinially achieved in the figures in both hole was not available.  Amount of chlorine used per m³ of water production 8g/m³   | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production 40g/m³   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water 88%   |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  Propriate pressure of water in Zagazig city  Propriate pressure of | eved n improvets have mpared overnous  | 8.0%  roved comprive been part d with basel prate as a wind some many consumption per m³ of water production 0.40kWh/m³ 0.30kWh/m³   | Amount of chlorine used per m³ of water production 8 g/m³ 7 g/m³   | 7.0%  The figures in both MTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³   | th Gharbia and RPs. The NRV es. On the other utilization of raw water 88% 90%   |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation) partially achi Depropriate pressure of water in Zagazig city  Iluation partially achi Depropriate pressure of water in Zagazig city  Iluation partially achi Depropriate pressure of water in Zagazig city  Iluation partially achi Depropriate pressure of water in Zagazig city  Iluation partially achi Depropriate pres | eved n imprets have mpared overnous  | 8.0%  roved compare been part d with basel orate as a wind some per m³ of water production 0.40k Wh/m³ 0.30k Wh/m³ 0.30k Wh/m³ 0.33k Wh/m³   | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 8g/m³   | 7.0%  The figures in both WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 38g/m³  | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water 88% 90% 90%   |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of was used in Zagazig city  Propriate propriate pressure of was used in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline   | eved n imprets have mpared overnous and the covernous and the cove | 8.0%  roved compare been part d with basel orate as a wind selection of the consumption per m³ of water production 0.40kWh/m³ 0.30kWh/m³ 0.30kWh/m³ 0.33kWh/m³ 0.33kW | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 8g/m³   | 7.0%  The figures in both the fovernorate of the figures and IM of the fovernorate of the figure in  | 5.0%  th Gharbia and RPs. The NRV es. On the other utilizatio of raw water  88% 90% 90% 89%   |  |
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| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  Iluation) partially achi  OP, most PIs have bee ernorates, though target in largely improved con wDM in Sharkiya Gernorate  Baseline  Target  Annual Average in 2013  Baseline  Target  Annual Average in 2013   | eved n impress have mpared overnous (a) (a) (b) (c) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d   | 8.0%  roved compare been part d with basel prate as a wind sumption per m³ of water production 0.40kWh/m³ 0.33kWh/m³ 0.33kWh/m³ 0.33kWh/m³ 3.28kWh/m³ 0.28kWh/m³ 0.28 | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 6g/m³ 7g/m³ 7g/m³   | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production 40g/m³ 36g/m³ 38g/m³ 48g/m³ 42g/m³ 47g/m³  | 5.0%  th Gharbia and RPs. The NRVes. On the other utilization of raw water  88% 90% 90% 89% 92% 90%   |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  Iluation) partially achi  OP, most PIs have bee ernorates, though target improved cool wDM in Sharkiya Good wDM in Sharkiya | eved n improvers have mpared overnous and the covernous and the co | 8.0%  roved comprive been part d with basel prate as a wind series of water production and the series of the serie | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 6g/m³ 7g/m³ 10g/m³  | 7.0%  The figures in both WTPs and IM oth Governorate stillable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 48g/m³ 42g/m³ 47g/m³ 45g/m³   | th Gharbia and RPs. The NRVes. On the other utilization of raw water  88% 90% 89% 92% 90% 85%   |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  Iluation) partially achi  OP, most PIs have bee ernorates, though target in largely improved con wDM in Sharkiya Gernorate  Baseline  Target  Annual Average in 2013  Baseline  Target  Annual Average in 2013   | eved n impress have mpare overnous (a) (a) (b) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d  | 8.0%  roved compare been part d with basel prate as a wind sumption per m³ of water production 0.40kWh/m³ 0.33kWh/m³ 0.33kWh/m³ 0.33kWh/m³ 3.28kWh/m³ 0.28kWh/m³ 0.28 | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 6g/m³ 7g/m³ 7g/m³   | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production 40g/m³ 36g/m³ 38g/m³ 48g/m³ 42g/m³ 47g/m³  | 5.0%  th Gharbia and RPs. The NRVes. On the other utilization of raw water  88% 90% 90% 89% 92% 90%   |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the connections of the connection o | propriate pressure of water in Zagazig city  Iluation) partially achi OP, most PIs have bee ernorates, though targ in largely improved con WDM in Sharkiya Grand in S | eved n impress have mpared overnous as a constant of the const | 8.0%  roved compare been part d with basel orate as a wind with basel orate as a wind ba | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 6g/m³ 10g/m³ 6g/m³ 6g/m³ 6g/m³  | 7.0%  The figures in both MTPs and IM oth Governorate at a sulfate used p m³ of water production  40g/m³ 36g/m³ 38g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water  88% 90% 90% 89% 92% 90% 85% 90%  |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  luation) partially achi  OP, most PIs have bee ernorates, though target in largely improved con wDM in Sharkiya Gernorate  Baseline  Target  Annual Average in 2013  Baseline  Target   | eved n impress have mpared overnous as a constant of the const | 8.0%  roved compare to been part d with basel orate as a wind with basel orate as a wind | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 6g/m³ 10g/m³ 6g/m³ 9g/m³ 8g/m³ 8g/m³ 7g/m³ 17g/m³ 17g/m² 1 | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 48g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³ 30g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³  | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water  88% 90% 89% 90% 89% 90% 85% 90% 86% 86% 82% 92%  |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the present of the connection of th | propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  propriate pressure of water in Zagazig city  luation) partially achi OP, most PIs have bee ernorates, though targen largely improved con WDM in Sharkiya Grammate  Baseline Target Annual Average in 2013   | eved n improvers have mpared overnous as a constant of the con | Energy consumption per m³ of water production 0.40kWh/m³ 0.33kWh/m³ 0.28kWh/m³ 0.30kWh/m³ 0.30kWh/m³ 0.30kWh/m³ 0.30kWh/m³ 0.35kWh/m³ 0.35kWh/m³ 0.35kWh/m³ 0.35kWh/m³ 0.36kWh/m³ 0.36kWh/m | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 10g/m³ 6g/m³ 9g/m³ 8g/m³ 6g/m³ 9g/m³ 6g/m³  | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 42g/m³ 42g/m³ 42g/m³ 43g/m³ 40g/m³ 36g/m³ 36g/m³   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water  88% 90% 89% 90% 85% 90% 86% 82% 92% 90%  |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Iluation) partially achi OP, most PIs have bee ernorates, though target in largely improved coon wDM in Sharkiya Good wDM i | eved n impress have mpared overnous (a) (a) (b) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d   | 8.0%  roved comprive been part d with basel orate as a wind state of the consumption per m³ of water production 0.40kWh/m³ 0.33kWh/m³ 0.28kWh/m³ 0.28kWh/m³ 0.30kWh/m³ 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 8g/m³ 10g/m³ 10g/m³ 8g/m³ 6g/m³ 9g/m³ 8g/m³ 8g/m³ 8g/m³ 8g/m³ 8g/m³ 6g/m³ 8g/m³ 8g/m² 8 | 7.0%  ne figures in bon WTPs and IM oth Governorate ailable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 34g/m³ 44g/m³ 34g/m³ 34g/m² | 5.0%  th Gharbia and RPs. The NRV and Effective utilization of raw water  88% 90% 90% 89% 92% 90% 85% 90% 86% 82% 92% 90% 90% 90%   |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of the connections of the present of the connection of th | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n impress have mpared overnormal control  | 8.0%  roved compare we been part d with basel orate as a wind some production of the compare was a wind some per m³ of water production of the compare was a wind some production of the compared water production of the compared water production of the compared water was a wind some production of the compared water wat | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 10g/m³ 10g/m³ 8g/m³ 6g/m³ 9g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³   | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of all sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 34g/m³ 44g/m³ 44g/m³ 44g/m³   | 5.0%  th Gharbia and RPs. The NRV ss. On the other state of the state |  |
| (Overall Goal) Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia Governorates. | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Iluation) partially achi OP, most PIs have bee ernorates, though target in largely improved coon wDM in Sharkiya Good wDM i | eved n impress have mpared overnormal control  | 8.0%  roved comprive been part d with basel orate as a wind state of the consumption per m³ of water production 0.40kWh/m³ 0.33kWh/m³ 0.28kWh/m³ 0.28kWh/m³ 0.30kWh/m³ 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m² 0.30kWh/m | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 6g/m³ 10g/m³ 8g/m³ 6g/m³ 9g/m³ 8g/m³ 6g/m³  | 7.0%  ne figures in bon WTPs and IM oth Governorate allable.  Amount of alla sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³ 36g/m³ 36g/m³ 34g/m³ 40g/m³ 33g/m³ 34g/m³   | 5.0%  th Gharbia and RPs. The NRV ses. On the other series of raw water  88% 90% 90% 89% 90% 85% 90% 86% 82% 90% 90% 90% 90% 90% 90% 90% 90%  |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n impress have mpared overnormal (a) (a) (b) (c) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d   | 8.0%  roved compare we been part d with basel orate as a wind with basel orate as a wind | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 6g/m³ 10g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ Amount of  | 7.0%  ne figures in bon WTPs and IM oth Governorate nilable.  Amount of alusulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 42g/m³ 42g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ Aug/m³ 40g/m³ Aug/m³ Aug/m²  | 5.0%  th Gharbia and RPs. The NRV es. On the other utilizatio of raw water  88% 90% 90% 89% 92% 90% 86% 82% 90% 90% 91% 90%   |  |
| Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia                              | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of inal distribution of inal distribution of the control of the contr | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n impress have mpared overnormal (a) (a) (b) (c) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d   | 8.0%  roved compare to been part of with basel orate as a wing sensumption per m³ of water production 0.40kWh/m³ 0.30kWh/m³ 0.40kWh/m³ 0.40kWh/m³ 0.42kWh/m³ 0.40kWh/m³ 0.40kWh/m² 0.40kWh/m² 0.40kWh/m² 0.40kWh/m² 0.40kWh/m² 0.40kWh/m² 0.40kWh/m² 0.40kWh/ | 7.0%  Ared with baselinially achieved in ine figures in behole was not available was not available.  Amount of chlorine used per m³ of water production  8g/m³ 7g/m³ 8g/m³ 6g/m³ 10g/m³ 6g/m³ 9g/m³ 8g/m³ 6g/m³ 6g/m³ 6g/m³ Ag/m³ 6g/m³ Ag/m³ 6g/m³ Ag/m³  | 7.0%  ne figures in bon WTPs and IM oth Governorate attailable.  Amount of always and sulfate used pm3 of water production  40g/m3  36g/m3  48g/m3  42g/m3  42g/m3  43g/m3  40g/m3  36g/m3  34g/m3  40g/m3  36g/m3  38g/m3  40g/m3  Amount of potassium  | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water  88% 90% 90% 89% 90% 85% 90% 86% 82% 92% 90% 90% 91% 90% Effective  |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n impress have mpared overnormal (a) (a) (b) (c) (c) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d   | 8.0%  roved compare to been part of with basel orate as a wing sensumption per m³ of water production  3.30kWh/m³  3.33kWh/m³  3.38kWh/m³  3.38kWh/m³  3.38kWh/m³  3.38kWh/m³  3.31kWh/m³  3.31kWh/m³  3.31kWh/m³  3.34kWh/m³  3.34kWh/m³  3.34kWh/m³  3.35kWh/m³  3.36kWh/m³  3.39kWh/m³  3.40kWh/m³  5.39kWh/m³  5.39kWh/m³  6.40kWh/m³  6.40kWh/m³  6.50swmption per m³ of  | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 6g/m³ 10g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ 8g/m³ 6g/m³ Amount of  | 7.0%  ne figures in bon WTPs and IM oth Governorate nilable.  Amount of alusulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 42g/m³ 42g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ Aug/m³ 40g/m³ Aug/m³ Aug/m²  | 5.0%  th Gharbia and RPs. The NRV and the Gharbia and RPs. The NRV and the control of raw water  88% 90% 90% 89% 90% 85% 90% 86% 82% 92% 90% 91% 90% 91% 90% Effective utilizatio   |  |
| Management capacity of operation and naintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n improvers have mpared overnous as a constant of the con | 8.0%  roved comprive been part d with basel orate as a wind with basel orate as a wind water production and water wat | Amount of chlorine used per m³ of water production 8g/m³ 7g/m³ 8g/m³ 6g/m³ 6g/m² 6g/ | 7.0%  The figures in both WTPs and IM of the Governorate at the sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 42g/m³ 47g/m³ 45g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 30g/m³ 40g/m³ 40g/m² 40g/m³ 40g/m² 40g/ | 5.0%  th Gharbia and RPs. The NRV and the Gharbia and RPs. The NRV and the control of raw water  88% 90% 90% 89% 90% 85% 90% 86% 82% 92% 90% 91% 90% 91% 90% Effective utilizatio   |  |
| Management capacity of operation and maintenance of water supply facilities is mproved in Sharkiya, Gharbia and Minufia                               | management capacity<br>of operation and<br>maintenance are<br>improved in Sharkiya,<br>Gharbia, and Minufia | Ratio of inal distribution of  | propriate pressure of water in Zagazig city  Propriate propriate pressure of water in Zagazig city  Baseline  Target  Annual Average in 2013  Baseline  Target  | eved n impress have mpared overnous as a constant of the const | 8.0%  roved compare to been part of with basel orate as a wing sensumption per m³ of water production  3.30kWh/m³  3.33kWh/m³  3.38kWh/m³  3.38kWh/m³  3.38kWh/m³  3.38kWh/m³  3.31kWh/m³  3.31kWh/m³  3.31kWh/m³  3.34kWh/m³  3.34kWh/m³  3.34kWh/m³  3.35kWh/m³  3.36kWh/m³  3.39kWh/m³  3.40kWh/m³  5.39kWh/m³  5.39kWh/m³  6.40kWh/m³  6.40kWh/m³  6.50swmption per m³ of  | Amount of chlorine used per m³ of water production 8g/m³ 8g/m³ 6g/m³ 10g/m³ 8g/m³ 6g/m³ 6g | 7.0%  The figures in both WTPs and IM with Governorate at a sulfate used p m³ of water production  40g/m³ 36g/m³ 42g/m³ 42g/m³ 42g/m³ 40g/m³ 40g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 36g/m³ 30g/m³ 40g/m³   | 5.0%  th Gharbia and RPs. The NRV es. On the other utilization of raw water  88% 90% 90% 89% 90% 85% 90% 86% 82% 92% 90% 90% 91% 90% Effective utilization of raw utilization of raw utilization of raw   |  |

Annual Average in 2018
Baseline

Annual Average in 2018

Annual Average in 2018

Baseline

Baseline

Target

Target

Target

El

Ramliya

Kaser

Boghdad

Mashiat Elyaqubya

Damat

0.35kWh/m<sup>3</sup>

 $0.40 kWh/m^3$ 

 $0.52 \text{kWh/m}^3$ 

0.33kWh/m<sup>3</sup> 0.44kWh/m<sup>3</sup>

 $0.56 \text{kWh/m}^3$ 

 $0.40 \text{kWh/m}^3$ 

0.53kWh/m<sup>3</sup> 0.43kWh/m<sup>3</sup>  $\frac{7g/m^3}{3g/m^3}$ 

 $4g/m^3$ 

 $7g/m^3$ 

 $3g/m^3$ 

 $6g/m^3$ 

 $8g/m^3$ 

 $3g/m^3$ 

 $\frac{6g/m^3}{6g/m^3}$ 

90%

91% 83%

90% 87%

82%

90%

88%

86%

 $2g/m^3$ 

 $2g/m^3$ 

 $5g/m^3$ 

 $\frac{2g/m^3}{4g/m^3}$ 

 $4g/m^3$ 

2g/m<sup>3</sup> 3g/m<sup>3</sup> 5g/m<sup>3</sup>

|                     | Target                 | $0.35 \text{kWh/m}^3$ | $3g/m^3$ | $2g/m^3$ | 90% |
|---------------------|------------------------|-----------------------|----------|----------|-----|
|                     | Annual Average in 2018 | $0.38 \text{kWh/m}^3$ | $4g/m^3$ | $2g/m^3$ | 91% |
| D                   | Baseline               | $0.59 \text{kWh/m}^3$ | $8g/m^3$ | $6g/m^3$ | 83% |
| Damanhor<br>Elwahsh | Target                 | $0.38 kWh/m^3$        | $3g/m^3$ | $3g/m^3$ | 90% |
| Elwansn             | Annual Average in 2018 | $0.54 \text{kWh/m}^3$ | $7g/m^3$ | $5g/m^3$ | 86% |

Minufia Governorate

| Name of<br>WTP |                        | Energy<br>consumption<br>per m <sup>3</sup> of<br>water<br>production | Amount of<br>chlorine used<br>per m³ of<br>water<br>production | Amount of alum<br>sulfate used per<br>m <sup>3</sup> of water<br>production | Effective<br>utilization<br>of raw<br>water |
|----------------|------------------------|---|--|---|---|
| Shebeen        | Baseline               | $0.27 \text{kWh/m}^3$   | $8g/m^3$   | 26g/m <sup>3</sup>  | 89%   |
| El Kom         | Target                 | $0.25 \text{kWh/m}^3$   | $5g/m^3$   | $20g/m^{3}$   | 92%   |
| El Kolli       | Annual Average in 2018 | $0.24 \text{kWh/m}^3$   | $7g/m^3$   | $20g/m^{3}$   | 91%   |
|                | Baseline               | $0.26 \text{kWh/m}^3$   | $6g/m^3$   | $25g/m^{3}$   | 90%   |
| Tala           | Target                 | $0.25 \text{kWh/m}^3$   | $5 \mathrm{g/m^3}$   | $20g/m^{3}$   | 92%   |
|                | Annual Average in 2018 | $0.26 \text{kWh/m}^3$   | $6g/m^3$   | $22g/m^{3}$   | 92%   |
| El             | Baseline               | 0.28kWh/m <sup>3</sup>  | $9g/m^3$   | $31g/m^{3}$   | 90%   |
| shohada        | Target                 | $0.25 \text{kWh/m}^3$   | $5 \mathrm{g/m^3}$   | $20g/m^{3}$   | 92%   |
|                | Annual Average in 2018 | 0.23kWh/m <sup>3</sup>  | $6g/m^3$   | $22g/m^{3}$   | 92%   |
|                | Baseline               | 0.48kWh/m <sup>3</sup>  | $8g/m^3$   | $20g/m^3$   | 89%   |
| El dabiba      | Target                 | $0.25 \text{kWh/m}^3$   | $5g/m^3$   | $20g/m^{3}$   | 92%   |
|                | Annual Average in 2018 | $0.23 \text{kWh/m}^3$   | $5g/m^3$   | $15g/m^{3}$   | 93%   |

[NRW]

| ١  | Governorate | PI                    | Baseline | Target | Annual Average in 2018 |  |  |  |
|----|-------------|-----------------------|----------|--------|------------------------|--|--|--|
| ١  | Gharbia     | NRW ratio             | 35%      | 25%    | 19%                    |  |  |  |
| Ш  | Gnarbia     | Reduction rate of NRW | -        | 28%    | 46%                    |  |  |  |
| II | Minufia     | NRW ratio             | 28%      | 20%    | 22%                    |  |  |  |
| ١  | Iviinuiia   | Reduction rate of NRW | -        | 28%    | 21%                    |  |  |  |

Note: \*PIs for SOP: (a) Energy consumption per m³ of water production (kWh/m³), (b) Amount of chlorine/alum sulfate/calcium hypochlorite/potassium permanganate used per m³ of water production (g/m³), (c) Ratio of effective utilization of raw water (%); PIs for NRW: (a) NRW ratio (%), (b) Reduction ratio of NRW (%); PIs for WDM: (a) Number of complaints per 1,000 connections on water suspension and low pressure, (b) Ratio of inappropriate pressure of water distribution (%)

Source: Project Final Report, questionnaire survey and interview with GHAPWASCO, MCWW and SHAPWASCO

#### 3 Efficiency

The project cost was within the plan, however, the project period exceeded the plan (ratio against plan: 98%, 125%, respectively). While the project period was extended for five months because of Japanese experts' evacuation from Egypt due to security reasons, this extension period is not counted as the project period. On the other hand, the duration for WDM activities was further extended for nine months due to the delay in procurement of the remote monitoring system and technical errors in the software of the system, which is counted as the project period. The outputs of the project were produced as planned. Therefore, the efficiency of the project is fair.

## 4 Sustainability

## <Policy Aspect>

The needs for reducing water losses in water supply networks and improving the water management system are stated in the sustainable development strategy, "Egypt Vision 2030".

## <Institutional Aspect>

There are departments responsible for SOP and NRW activities both in GHAPWASCO and MCWW, and there is a department responsible for WDM activities in SHAPWASCO. In GHAPWASCO, 37 staff in total is in charge of SOP activities and 26 staff in total is in charge of NRW activities. In MCWW, 30 staff in total is in charge of SOP activities and 40 staff in total is in charge of NRW activities. In SHAPWASCO, nine staff in total is in charge of WDM activities. According to these three companies, the number of staff is sufficient to manage SOP, NRW and WDM activities in three Governorates.

## <Technical Aspect>

Most staff for whom necessary technical skills were transferred under the project still work in three companies. According to these companies, the skill level of staff is sufficient to manage SOP, NRW and WDM activities in three Governorates. According to GHAPWASCO, staff training is conducted according to their needs, and training on leakage detection and O&M of necessary equipment was provided for 23 staff in 2018. According to MCWW, staff training is conducted regularly, and training on SOP, leakage detection and O&M of necessary equipment was conducted twice both in 2017 and 2018 for 25 staff each (100 staff in total). In SHAPWASCO, training on WDM and O&M of necessary systems and equipment was provided by external companies once a year in 2016, 2017 and 2019 for 19 staff in total. SOPs and manuals produced under the project have continuously been utilized in GHAPWASCO, MCWW and SHAPWASCO. It was observed during the ex-post evaluation that most equipment procured under the project is also used in a good condition.

# <Financial Aspect>

In GHAPWASCO, approximately 3.5 to 3.9 million LE per year was allocated for rehabilitation and maintenance of water supply facilities (WTPs, IMRPs and wells) and approximately 2.7 to 7.0 million EGP per year was allocated for replacing and renewal of water pipes in the fiscal years of 2016/17, 2017/18 and 2018/19. In MCWW, approximately 3.0 to 5.5 million EGP per year was allocated for rehabilitation and maintenance of water supply facilities and approximately 2.2 to 3.6 million EGP per year was allocated for replacing and renewal of water pipes in the fiscal years of 2016/17, 2017/18 and 2018/19. In SHAPWASCO, approximately 2.0 to 5.0 million EGP per year was allocated for WDM activities in the fiscal years of 2016/17, 2017/18 and 2018/19. According to these companies, the budget amount is sufficient to manage SOP, NRW and WDM activities in three Governorates, and in case they need more budget, HCWW can provide financial assistance.

### <Evaluation Result>

In light of the above, no problem has been observed in terms of the policy, institutional, technical and financial aspects. Therefore, the sustainability of the effectiveness through the project is high.

<sup>\*\*</sup> Reduction rate of NRW (%) = ("NRW ratio before improvement (%)" - "NRW ratio after improvement (%)) / "NRW ratio before improvement (%)" \*\*\* Low service pressure ratio = "Total hours of low pressure recorded at all continuous monitoring points" / ("Number of points for continuous pressure monitoring" x 365days x 24hours)

## 5 Summary of the Evaluation

The project had achieved the Project Purpose at project completion, and it partially achieved the Overall Goal at ex-post evaluation: most PIs were improved and targets were mostly achieved in model facilities/areas. Most PIs have been improved compared with baseline figures in Gharbia and Minufia Governorates as a whole, while targets have been partially achieved in WTPs and IMRPs and data on WDM in Sharkiya Governorate as a whole was not available. Regarding the sustainability, no problem has been observed. Regarding the efficiency, the project period exceeded the plan.

Considering all of the above points, this project is evaluated to be highly satisfactory

## III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

• It is recommended that HCWW would share the knowledge and experiences gained through the project with all of its 25 affiliated companies to enhance project effects. Also, HCWW would consider providing training for participants from other countries such as Middle East and African regions to share its successful experiences obtained under the project.

### Lessons Learned for JICA:

- If a project achieves good results and project counterparts prove to be efficient by the time of mid-term evaluation, JICA can consider conducting a knowledge sharing seminar for relevant authorities in other governorates and/or a third country training program for participants from other countries within the remaining period of the project to share the good results.
- While most equipment procured under the project is used in a good condition, minor troubles were observed in batteries for portable flow meters. This equipment was imported from Japan and implementing agencies had difficulties to find a local supplier of spare parts. Thus, when procuring equipment under a project, suppliers who have local branches or at least local agents in the recipient country should be selected so that implementing agencies can obtain necessary after-sales service and spare parts.



SOP in Tanta El Teraa El Melahia WTP (model facility) (GHAPWASCO)



SOP in Shebeen El Kom WTP (non-model facility) (MCWW)